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In the Supreme Court of the United States

OCTOBER TERM, 1971

No. 71-485

ROBERT GOTTSCHALK, COMMISSIONER OF PATENTS,
PETITIONER

v.

GARY R. BENSON AND ARTHUR C. TABBOT

ON WRIT OF CERTIORARI TO THE UNITED STATES COURT OF CUSTOMS AND PATENT APPEALS

BRIEF FOR THE PETITIONER

OPINION BELOW

The opinion of the Court of Customs and Patent Appeals (Pet. App. 17–31) is reported at 441 F. 2d 682. The opinion of the Patent Office Board of Appeals is reprinted at Pet. App. 36–41.

JURISDICTION

The judgment of the Court of Customs and Patent Appeals (Pet. App. 32) was entered on May 6, 1971. On July 26, 1971, Mr. Justice Black extended the time for filing a petition for a writ of certiorari to October 3, 1971. The petition was filed on October 4, 1971, and was granted on February 22, 1972. The

jurisdiction of this Court rests on 28 U.S.C. 1256. *Brenner* v. *Manson*, 383 U.S. 519.

QUESTION PRESENTED

Whether a method of converting numerical information from binary-coded-decimal numbers into pure binary numbers, for use in programming conventional general-purpose digital computers, is patentable.

CONSTITUTIONAL AND STATUTORY PROVISIONS INVOLVED

Article I, Section 8, Clause 8, of the Constitution of the United States provides:

> The Congress shall have Power * * *
>
> * * * * * * *
>
> To promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries,

35 U.S.C. 100(b) provides:

> The term "process" means process, art or method, and includes a new use of a known process, machine, manufacture, composition of matter, or material.

35 U.S.C. 101 provides:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

STATEMENT

In October 1963 respondents, represented by Bell Telephone Laboratories, Inc., filed in the Patent Office "Application Serial Number 315,050, for Conversion of Numerical Information" (R. 3).[1] The invention alleged by respondents related "to the processing of data by program and more particularly to the programmed conversion of numerical information" (R. 3, 142) in general purpose digital computers. Specifically, respondents claimed a method for converting binary-coded-decimal (BCD) numerals into pure binary numerals (R. 3). See *infra*, pp. 7–13. The claims were not limited to any particular art or technology (such as pharmacy or telephony), to any particular apparatus or machinery (such as a steam engine or telephone switching system), or even to any particular end use (such as controlling the speed of motors or converting telephone dial signals from one form to another). Rather, they broadly covered any use of the claimed method in a general purpose digital computer of any type (see Resp. Br. in Opp., p. 1). Claims 8 and 13 of the amended application were rejected by the Patent Office (Pet. App. 36–41), but were sustained by the Court of Customs and Patent Appeals (Pet. App. 27–31). They are the claims involved here.[2]

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[1] "R." refers to the printed transcript of record in the Court of Customs and Patent Appeals.

[2] Claim 8 reads (R. 142–143, Pet. App. 19):

"The method of converting signals from binary coded decimal form into binary which comprises the steps of—

(1) storing the binary coded decimal signals in a reentrant shift register,

(2) shifting the signals to the right by at least three places,

1. DIGITAL COMPUTERS

Computers are devices that solve problems involving numerical information or data convertible to numerical form. These devices have developed in two

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until there is a binary "1" in the second position of said register,

(3) masking out said binary "1" in said second position of said register,

(4) adding a binary "1" to the first position of said register,

(5) shifting the signals to the left by two positions,

(6) adding a "1" to said first position, and

(7) shifting the signals to the right by at least three positions in preparation for a succeeding binary "1" in the second position of said register."

Claim 13 reads (R. 143, Pet. App. 19–20):

"A data processing method for converting binary coded decimal number representations into binary number representations comprising the steps of—

(1) testing each binary digit position *i*, beginning with the least significant binary digit position, of the most significant decimal digit representation for a binary "0" or a binary "1";

(2) if a binary "0" is detected, repeating step (1) for the next least significant binary digit position of said most significant decimal digit representation;

(3) if a binary "1" is detected, adding a binary "1" at the (i+1)th and (i+3)th least significant binary digit positions of the next lesser significant decimal digit representation, and repeating step (1) for the next least significant binary digit position of said most significant decimal digit representation;

(4) upon exhausting the binary digit positions of said most significant decimal digit representation, repeating steps (1) through (3) for the next lesser significant decimal digit representation as modified by the previous execution of steps (1) through (3); and

(5) repeating steps (1) through (4) until the second least significant decimal digit representation has been so processed."

branches. One branch operates by use of an analogy between measurements of continuous data within the computer system and the system being studied. These are known as analogue computers.[3] In contrast, a digital computer, as its name implies, operates on data expressed in digits, i.e., discrete and discontinuous numerical elements. The difference between a digital computer and an analogue computer is essentially the difference between counting and measuring. "A digital computer solves a problem by actually doing arithmetic in much the same way a person would by hand."[4]

In a digital computer, the digits are represented in physical form. Some of these representations are permanently retained or stored as components of the computer. For example, Pascal's adding machine, built in 1642, used ten-toothed gears whose positions represented digits in the decimal number system. The gears in effect functioned as a storage unit or "digit register." A "digit register" is any device which retains the physical representation of a digit, and can be in the form of gears, electrical switches, or electronic circuitry.[5] In addition to the numbers permanently stored in digit registers, other numerical data must—in order for a digital computer to be operated—be put into the computer in a form discernible to its computer mechanism. In a calculating machine,

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[3] The patentability of analogue computer systems is not involved in this case.

[4] Benray, *Understanding Digital Computers* (1964) p. 4.

[5] Stibetz and Larrivee, *Mathematics and Computers*, 47, 96–97.

a human operator manually inserts data by operating a keyboard. In an automatic digital computer, groups or sequences of arithmetical operations are performed without need for continuous human intervention in the process.[6] Such a computer operates under the control of a set of stored internal instructions, which can be invoked by further instructions discernible to the computer, so that they operate upon both new and previously stored data.

In modern digital computers the representation of numbers may be in the form of a time-series of electrical pulses, magnetized spots on the surface of tapes, drums, or discs, charged spots on cathode ray tube screens, or the presence or absence of punched holes on paper cards, or may be accomplished by means of other discontinuous electrical or physical conditions which can be assigned discrete digit values for each permitted physical state. The computing process is controlled by arranging or processing sets of signals (such as electrical pulses), in the proper sequence, in a form compatible with the computer's internal characteristics. The system of arrangement of the signals is the "program"—"a sequence of coded instructions for a digital computer" (Webster's Third New International Dictionary, p. 1812).[7] Through the instruc-

[6] See McCormick, *Digital Computer Power*, p. 4 (1959).

[7] The basic parts of a digital computer are its (1) input, (2) storage unit, (3) arithmetic and logic unit, (4) control unit, and (5) output. Data and instructions are inserted into the computer at the input. The storage unit receives data, and holds it for subsequent use or retrieval. The arithmetic and logic unit consists of various circuits for performing multiplication, division, and other arithmetical or logical operations. The control unit includes the circuits that effect selection and retrieval of

tions must be expressed in a form which the computer is designed to recognize, the program itself is merely a sequence of mathematical steps into which the problem the computer is solving can be broken down. While the computer operates by physical equivalents of logical functions, the functions themselves are the same procedures which a human being would perform in working the same computation, but reduced to the physical characteristics of the device.

It is possible to build a computer so that its hardware elements perform only the operations called for by a particular program. But this would require a different computer for each operation and would render use of computers prohibitively expensive. Instead, therefore, general purpose computers, which can perform operations under many different programs, are used. The programs are the variable operating factors which give the computer's hardware circuitry its general utility.

2. MATHEMATICAL ELEMENTS OF RESPONDENT'S CLAIMS: THE BINARY NOTATION SYSTEM, ALGORITHMS, DECIMALS, BINARY CODED DECIMALS, AND PURE BINARY NUMBERS

Digital computer data is automatically recorded or "coded" by means of the binary notation system, a method of numerical representation using as digits

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instructions from storage or from outside the computer, in proper sequence, and the carrying out of each of the coded instructions by generation and application of proper signals to the appropriate units. See generally Benray, *supra*.

only two characters or symbols—*0* and *1*. These symbols are arranged in a system of place values based on ascending powers of the number 2.[8] The binary notation system is used because the two symbols *0* and *1* may be correlated with the logical and mathematical functions of the concepts "true" and "false", or "yes" and "no", and these in turn can be physically represented by switch-like alternatives, such as the presence or absence of an electrical signal or pulse.[9] Use of the decimal number system in digital computers requires an unfeasibly complex electronic apparatus with far more intricately graded representations of the decimal characters.

Respondents seek a patent on a method of programming a general purpose digital computer to convert "signals" or "numerical representations" from binary coded decimal form (BCD) (see *infra*, pp. 11–12) into pure binary form. Any particular procedure for solving a given type of mathematical problem is known as an "algorithm".[10] The procedure which respondents set forth in their claims constitutes an algorithm, *i.e.*, a generalized formulation for programs, to solve the mathematical problem of converting from one form of numerical rep-

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[8] Binary or dyadic notation is said to have been described by the Chinese about 3000 B.C. It was reconceived in Europe by Leibniz in the 17th Century. 4 Newman, *The World of Mathematics*, 2422 (1956).

[9] Computer circuitry is usually designed on the basis of the symbolic logic conceived in 1854 by George Boole to express Aristotelian logic algebraically. Benrey, *supra*, at p. 49.

[10] The Random House Dictionary of the English Language (1966 ed., p. 37).

resentation to another. Although respondents have submitted two specific programs embodying this algorithm to the Patent Office (one to the Examiner, in the application itself, and one on appeal to the Board, see R. 9, 81), the claims themselves (*supra*, n. 2) are directed to the generic formulation set out in the algorithm. From this formulation particular programs may be developed as specific applications (R. 139; Pet. App. 39–40).[11]

A brief description of the decimal, pure binary, and BCD systems will be helpful in understanding respondents' claims.

Decimal notation is commonly used to represent numerical information. For graphic representation purposes, the decimal system uses as digits the ten characters or symbols *0, 1, 2, 3, 4, 5, 6, 7, 8,* or *9,* arranged in a numerical sequence such that the value contributed to the numeral by any digit depends, as it does in any positional system of notation, both on its individual value and on its relative position in the numeral.[12] The positional values for digits increase in

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[11] Different computers have different internal circuits and apparatus; accordingly, they require different specific programs (adapted to the particular characteristics of the computer involved) to carry out the algorithm which solves a particular problem. Hence, numerous different specific programs may apply the same algorithm.

[12] To avoid confusion, the term "numeral" is used here to refer to the entire numerical expression, and the term "digit" is used to refer to the members thereof. Thus, in the usage employed here, 6 is the digit in the tens position in the decimal numeral (365) that represents the number of days in a year. The same numbers can be represented as the Roman numeral CCCLXV. See generally American National Stand-

consecutively ascending powers of 10 from right to left. Decimal numerals are written by placing digits in the appropriate positions or columns of the numerical sequence, *i.e.*, "units" (10^0), "tens" (10^1), "hundreds" (10^2), "thousands" (10^3), etc.[12] Accordingly, the numeral 1492 signifies $(1\times10^3)+(4\times10^2)+(9\times10^1)+(2\times10^0)$.

The pure binary system of positional notation uses two symbols as digits, *0* and *1*, placed in a numerical sequence with values based on consecutively ascending powers of 2. These values increase from right to left, just as the position values of decimal numerals increase from right to left in consecutive powers of 10. In pure binary notation, what would be the tens position of a decimal numeral is thus the twos position; similarly, pure binary's fours position corresponds to decimal's hundreds, and pure binary's eights to decimal's thousands. When *1* fills a digit position in binary, it carries the value of 2 to the power for that position; when *0* fills it, the position has no value (or zero times the value assigned to the position). The position to the farthest right (the units column) distinguishes odd and even numbers. When this position is filled with *1*, the sequence of digits represents an odd number; when it is filled with *0*, it represents an even number.

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ard Vocabulary for Information Processing, Standard No. X3.12–1970, adopted by Office of Management and Budget, October 16, 1970; Standard Dictionary of Computers and Information Processing (Weik ed.).

[12] In exponential notation of this type, the power of ten corresponding to the "units" position is zero, and $10^0=1$. Similarly, $2^0=1$.

Any decimal number from 0 to 10 can be represented in the binary system with four digits or positions. Thus the following table can be compiled:

Decimal	Shown as the sum of powers of 2				Pure Binary
	2^3 (8)	2^2 (4)	2^1 (2)	2^0 (1)	
0 =	0 +	0 +	0 +	0	= 0000
1 =	0 +	0 +	0 +	2^0	= 0001
2 =	0 +	0 +	2^1 +	0	= 0010
3 =	0 +	0 +	2^1 +	2^0	= 0011
4 =	0 +	2^2 +	0 +	0	= 0100
5 =	0 +	2^2 +	0 +	2^0	= 0101
6 =	0 +	2^2 +	2^1 +	0	= 0110
7 =	0 +	2^2 +	2^1 +	2^0	= 0111
8 =	2^3 +	0 +	0 +	0	= 1000
9 =	2^3 +	0 +	0 +	2^0	= 1001
10 =	2^3 +	0 +	2^1 +	0	= 1010

Binary-coded-decimal (BCD) numerals employ concepts of both the decimal and the pure binary systems. In the BCD system decimal numerals are symbolized in terms of the first ten binary numerals. This is done by replacing the character for each component decimal digit in the decimal numeral with the corresponding four-digit binary numeral (see the right column of the preceding table). The numerical value contributed by each four-binary-digit member of a BCD numeral depends, as it does in the ordinary decimal system, both on its individual value and on its position in the sequence, and the positional values assigned are the ordinary decimal units, tens, hundreds, etc. For example, decimal 53 is represented as 0101 0011 in BCD, because decimal 5 (as shown in the preceding table) is equivalent to binary 0101; and

decimal 3 is equivalent to binary 0011. Accordingly, the BCD numeral should be understood as 0101 tens plus 0011 units. In pure binary notation, however, in which binary place values are used rather than decimal place values, decimal 53, which is $2^5+2^4+0+2^2+0+2^0$ $(32+16+0+4+0+1)$, equals binary 110101.

For some computer operations it is desirable to convert from the BCD system to the pure binary system. The conversion of BCD numerals to pure binary numerals can be accomplished by a conventional series of mental steps, through the use of the preceding table showing binary equivalents of decimal numerals from 0 to 9, and by the mathematical processes of addition and multiplication by the rules of the binary number system (see Pet. App. 33–35).[14] The respondent applicants vary the ordinary arithmetic steps that a human being would use to accomplish such a conversion, by changing the order in which they are accomplished, changing the symbolism for writing the multiplier used in some steps (using a blank space for a terminal zero), and by taking subtotals after each successive operation (*ibid.*).[15] No

[14] The conversion procedure involves taking the sum of one times the BCD units digit, plus ten times the BCD tens digit, plus one hundred times the BCD hundreds digit, etc.—with all the addition and multiplication operations carried out in binary. Thus, decimal 53, which, in BCD, is 0101 0011 (see above), is $0101\times1010+0011\times0001$. Performing the multiplications, this is $110010+0011$; and then performing the addition, the result, in pure binary, is 110101, as indicated above.

[15] The latter may be considered an ordinary intermediate step in the use of computers, because typically a computer will add only two numbers together at a time, take the sub-total, then go

new machinery or hardware is necessary to complete the series of logical or mathematical steps described. The mathematical procedures recited in the claims can be carried out in existing computers long in use; they can also be performed without a computer, as the respondents showed before the Patent Office (see Pet. App. 33; R. 23).

3. THE PROCEEDINGS

The Patent Office examiner rejected claims 8 and 13 as unpatentable "nonstatutory subject matter" under 35 U.S.C. 101, on the ground that the program described in the claims was not a "process" within the statutory definition of 35 U.S.C. 100(b), but merely a series of mathematical calculations or mental steps (R. 135–136; see Pet. App. 21). The Patent Office Board of Appeals made the same determination and rejected the claims (Pet. App. 36–41). The Board rejected the applicants' argument that, despite the breadth of the claims, the subject matter came within the ambit of Section 101 because the descriptive portion of the application indicated that the method was intended for use in a machine (Pet. App. 38–39):

> We are not convinced by appellants' arguments to the effect that the disclosure in an application, not the claims thereof, should be the proper basis for judging whether the claims are drawn to subject matter outside the statute.

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n to add the next number to the sub-total, and so on—rather han adding all the numbers, or all the digits of a given digit osition for all the numbers, at once as a human does.

> Certainly a claim which embraces that which was already in the prior art or was obvious therefrom could not be sustained under 35 U.S.C. 102 or 103 merely because there may have been something patentable disclosed in the specification. 35 U.S.C. 112 requires the claim to point out the subject matter which the applicant regards as his invention so that a claim which is so broad and indistinct as to embrace within its terms subject matter that cannot be patented under section 101 of the statute, similarly must be unpatentable.

The Court of Customs and Patent Appeals reversed,[16] holding that the claimed method does qualify as statutory subject matter (a "process") under 35 U.S.C. 101 (Pet. App. 17–31). Citing with approval a concurring opinion in one of its own recent decisions to the effect that "'in reality very little remains * * * of the "mental steps" doctrine'" (Pet. App. 27), the court noted that the processes in question are "machine implemented" (claim 8) (Pet. App. 28) or are of "no practical use other than the more effective operation and utilization of a * * * digital computer" (claim 13) (Pet. App. 31). Therefore, the court reasoned, the alleged process is in the "technological" or useful arts and, consequently, is statutory subject matter patentable under 35 U.S.C. 101 (Pet. App. 31).

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[16] Under the administrative and judicial review system for patent applications, the role of the Court of Customs and Patent Appeals corresponds to that of a court of appeals in reviewing decisions of other administrative agencies (see 35 U.S.C. 141–146; see generally *Brenner* v. *Manson*, 383 U.S. 519, 524–527). The Board of Appeals is the administrative agency. See 35 U.S.C. 7, 134; 37 C.F.R. 1.196.

SUMMARY OF ARGUMENT

I. The patent system has, from its inception, been directed solely to the pragmatic application of ideas, and not to ideas and principles themselves. The underlying rationale of the limitation of patentability to the pragmatic application of ideas is that ideas and mental processes as such—no matter how complex—are the basic currency of "tools" of scientific development, whose free exchange must not be hindered by the granting of monopolies.

The "discovery" which respondents claim here is nothing more than a sequence of mathematical steps which differ very little from the mental steps that an ordinary human being could be expected to follow. Their theorem follows automatically from the definitions of pure binary, decimal, and BCD numbers and from the axioms for or definitions of addition and multiplication in the binary system, and, therefore, is not the kind of "discovery" contemplated either by the patent clause of the Constitution or by Section 101 of the Patent Code.

Even assuming *arguendo* that respondents' procedure is more than an obvious extension of known mathematical principles, their claims are entirely without limitation as to end use or apparatus, and, consequently, embrace any and all known and unknown purposes or uses for their mathematical procedure. Under this Court's decisions, therefore, respondents' claims fall substantially short of the statutory standard of patentability. Compare *O'Reilly* v. *Morse*, 15 How. 62, with *The Telephone Cases*, 126 U.S. 1. Neither of

respondents' claims at issue here contains a use limitation, and only claim 18 even arguably asserts an apparatus limitation, by referring to a "shift register", which implies that the claimed method will be carried out by a digital computer or other device utilizing such a mechanism.

This general apparatus reference is insufficient to confer patentability on respondents' method, both because of its undue breadth and because there is no finding or allegation that the mathematical principle respondents claim synergizes with the computer or cooperates with it in some new and unconventional way that makes for invention. Respondents' assertion that they could have disclosed specially-designed wire circuits that were a permanent physical part of a machine built to carry out the procedures they claim is doubtful at best, but, in any event, is irrelevant to the issue before this Court, which is whether the Patent Office properly rejected the claims that respondents in fact presented. Respondents' assertion that they plan to use their method in a "stored-program-controlled electronic telephone switching system for converting dial signals into binary signals" (Resp. brief in Opp., pp. 1–2) is also irrelevant to the issue in this case, because the asserted end use is not an element of the claim which respondents presented to the Patent Office.

The decision below is thus incompatible with the decisions of this Court which hold that pure mental processes are not patentable. If allowed to stand, the decision would grant monopoly protection to ideas which have always been part of the public domain and which are part of the common intellectual property

that every member of society has the right to apply to existing and future machinery and technology.

II. Categorization of computer programming methods such as those claimed by respondents as patentable subject matter would tend to undermine the present patent system. There is at present no adequate system of classification, searching technique and research files for the rapidly expanding volume of art in this area. Indeed, it is highly doubtful whether the criteria for examination of patent applications required by this Court in *Graham* v. *John Deere*, 383 U.S. 1, 18–19, can effectively be applied to applications for patents on computer programs. The President's Commission on the Patent System [illegible] expressed substantial doubt that an effective system for classifying computer programming art can be devised. The difficulties of devising such a system are inherent in the classification of broad abstract mental processes, and are an additional reason why the Court ought not to discard the mental steps doctrine. If protection of some kind is desirable for computer programs, the responsibility for devising and delimiting such protection should be left to Congress.

ARGUMENT

I

THE CLAIMED PROCESS IS UNPATENTABLE BECAUSE IT IS NO MORE THAN A SET OF MENTAL STEPS FOR CARRYING OUT MATHEMATICAL PROCEDURES

Since the first patent law was enacted in 1790 (1 Stat. 109), the patent system has been directed solely

to the pragmatic application of ideas. Thus, patents have been issued only with respect to specific and tangible machinery, articles of manufacture, chemical and other physical compositions, and processes for making or using such machinery, articles of manufacture, and compositions (35 U.S.C. 100(b), 101),[17] in a specific useful way. *Brenner* v. *Manson*, 383 U.S. 519. These four classes alone—"machines," "articles of manufacture," "compositions," and "processes" for making or using them, 35 U.S.C. 101—are the categories of statutory subject matter. Principles and ideas, as contrasted with the specific and tangible application of those ideas to a specific use, have always constituted nonstatutory subject matter which cannot qualify for the monopoly grant embodied in a patent. *Le Roy* v. *Tatham*, 14 How. 156, 174–175; *Rubber-Tip Pencil Co.* v. *Howard*, 20 Wall. 498, 507; *Mackay Radio & Tel. Co.* v. *Radio Corporation*, 306 U.S. 86, 94.[18]

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[17] The four statutory classes go back to the 1793 Act (1 Stat. 318; see also similar wording of the original 1790 Act, 1 Stat. 109; *Graham* v. *John Deere Co.*, 383 U.S. 1, 6–7), and have remained unchanged, except that in the 1952 Act the word "process" replaced the prior term "art". This verbal change was made only for reasons of clarity and did not reflect a substantive change in the scope of patentability. See Revisor's Note, 35 U.S.C. 101.

[18] There are two types of nonstatutory subject matter. The first is that which is not covered by inclusion in the four statutory categories of Section 101. The other type is that which may fit within one of the four categories but is nonetheless [redacted] excluded, expressly or by implication, in other provisions of law. Atomic weapons, for example, are expressly excluded (42 U.S.C. 2181(a)). Ornamental designs for articles of manufacture are patentable under 35 U.S.C. 171, and are excluded by implication from Section 101.

The statutory restrictions on patentability reflect the limited concept of "Discoveries" which advance the "useful Arts" for which the Constitution authorizes the grant of monopoly protection. See *Graham* v. *John Deere Co.*, 383 U.S. 1, 5–6. The underlying rationale of the limitation of patentability to the pragmatic application of ideas is that ideas as such—scientific principles, laws of nature, mental processes and abstract intellectual concepts—are the basic currency or mental tools of scientific and technological development, whose free exchange must not be hindered by indiscriminate granting of patent monopolies, lest the result be to obstruct, rather than promote, "the Progress of Science and useful Arts." Art. I, Section 8, Clause 8. See the selection from letter of Thomas Jefferson quoted in *Graham* v. *John Deere Co.*, 383 U.S. 1, 8, n.2. For that reason, the Pythagorean Theorem, the binomial theorem, Gibbs' vectors, the Laplace Transform, the general theory of relativity, and Russell's theory of types, for example, even though the products of great intellectual effort, or a flash of genius, are not patentable under our law. Mathematical theorems, abstractions, ideas, and laws of nature are the property of everyone and the exclusive right of no one.

The "discovery" which respondents claim here is that BCD numerals may be converted into binary numerals by multiplying the hundreds digit by one hundred, multiplying the tens digit by ten, and multiplying the units digit by one, according to the rules of multiplication in the binary system, and then adding these products together, according to the binary

rules for addition. The process which they claim to have discovered is nothing more than a sequence of mathematical steps (or arithmetical calculations) that are analogous, for example, to a method for the conversion of Roman into Arabic numerals, or the method of solving a quadratic equation by "completing the square." The applicants' process differs only in some minor respects from the mental steps that an ordinary human being could be expected to follow (see pp. 12–13, *supra*). In effect, they seek a patent grant on a theorem that follows automatically from the definitions of pure binary, decimal, and BCD numbers, and from the axioms for or definitions of addition and multiplication in the binary system. And whether the theorem is elementary (as we believe it is) [*] or complex makes no difference, for what is claimed here is not the kind of patentable "discovery" contemplated either by the patent clause of the Constitution or by Section 101 of the Patent Code. Indeed, the Court has repeatedly held that a scientific principle, rule, formula or mathematical expression is not a patentable process, regardless of the novelty or importance of the discovery. *Le Roy* v. *Tatham, supra; Mackay Radio & Tel. Co.* v. *Radio Corporation, supra; O'Reilly* v. *Morse*, 15 How. 62;

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[*] Indeed, though this issue was not argued in the Court of Customs and Patent Appeals, it is doubtful whether the mathematical procedure respondents claim here involves "invention" or is sufficiently nonobvious to those familiar with the art to meet the requirements of 35 U.S.C. 103.

Tilghman v. *Proctor*, 102 U.S. 707; *Risdon Iron and Locomotive Works* v. *Medart*, 158 U.S. 68.[20]

As the Court observed in *Funk Bros. Seed Co.* v. *Kalo Co.*, 333 U.S. 127, 130:

> He who discovers a hitherto unknown phenomenon of nature has no claim to a monopoly of it which the law recognizes. If there is to be invention from such a discovery, it must come from the application of the law of nature to a new and useful end.* * *

Even assuming, therefore, that the applicants' mathematical procedure was the fruit of their discovering hitherto unknown and unobvious mathematical principles, their claims are so abstract and sweeping as to cover any and all known and unknown purposes or uses for this method for BCD-to-pure-binary conversion, whether in the operation of a telephone, a railroad train, a credit-card verification system, a customer-operated instant cash withdrawal banking system, or Shepardizing law reports,[21] and whether carried out by means of any presently-

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[20] See also *Don Lee Inc.* v. *Walker*, 61 F. 2d 58 (C.A. 9); *Halliburton Oil Well Cementing Co.* v. *Walker*, 146 F. 2d 817 (C.A. 9). Cf. *Burr* v. *Duryee*, 1 *Wall.* 531, 570, *Fuller* v. *Yentzer*, 94 U.S. 288; *Baker* v. *Selden*, 101 U.S. 99, 103.

[21] These examples involve typical human-machine interfaces, where the human side is necessarily in decimal and the machine side in binary. The human input to a law report citator, for example, would have to be in decimal form, because that is how law reports are paginated and cited. The data will be stored, however, in binary form, for convience and economy. As the court below indicated (Pet. App. 18), the conversion from decimal citation to a form compatible with binary storage will probably require a BCD-to-binary conversion.

known or future-devised machinery. By seeking to claim their mathematical procedure without limitation as to end use or apparatus, respondents have placed themselves outside the statute.

The decided cases do not settle the precise point at which a method patent claim utilizing a mathematical formula or series of mental steps is sufficiently limited by reference to a specific end use and apparatus to come within the statutory categories of patentability. Comparison of two landmark cases decided by this Court, however, shows that respondents' claim in this case falls substantially short of the statutory standard. In *O'Reilly* v. *Morse*, 15 How. 62, the Court struck down the claim made by the inventor of the telegraph to a patent monopoly on the use of electricity to print characters at a distance.[*] Morse had also developed a particular apparatus which would exploit the principle he had discovered. The Court held that he was entitled to the exclusive right to that particular apparatus, but not to the principle itself or to any apparatus which others might in the future devise to exploit the method of conveying messages by electricity. 15 How. at 112-119. The lack of apparatus limitation was fatal to Morse's general claim.

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[*] Morse's eighth claim read:

"I do not propose to limit myself to the specific machinery * * * described in the foregoing specification and claims; the essence of my invention being the use of the motive power of the electric or galvanic current, which I call electro-magnetism, however developed for marking or printing intelligible characters * * * at any distance, being a new application of that power of which I claim to be the first inventor or discoverer" (15 How. at 112).

By comparison, the claim which this Court upheld in *The Telephone Cases*, 126 U.S. 1, 537–538, had both use limitations indicating a particular field of art and significant apparatus limitations, which together gave reasonable boundaries to the claimed monopoly. First, the claimed use was confined to telephone systems and did not extend to other technical or nontechnical arts —a limitation that respondents have not placed upon the monopoly they seek here. Second, the Court noted that the applicants' claims were limited to the method they had devised as practiced with only two particular types of microphone and loudspeaker apparatus."

We submit that respondents' claims at issue here (*supra*, n. 2) fall significantly considerably short of the limitation requirements that emerge from the foregoing decisions of this Court. These cases show that claims for methods exploiting natural principles or laws (including the laws of physics or mathematics), if they are patentable at all, are patentable only when they contain proper limitations both (1) confining the monopoly over the application of the method to a specified field of technology and (2) confining the grant to a particular type of apparatus or hardware to be used

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[11] The specific apparatus to which the method claims were limited were the "magneto" apparatus, which is similar to the magnetic phonograph pickup and ordinary radio loudspeaker, and apparatus employing a variable resistance, which is similar to the ordinary carbon granule telephone mouthpiece. Bell's method claim covered the method as used with both types of apparatus, but his apparatus claim covered only the magneto system because "when Bell got his patent he thought the magneto method was the best" (*id.* at 538). The infringing use was covered by the method claim, but not the apparatus claim.

to carry out the method. Like the claims which the Court rejected in *Morse*, respondents' claim 13 has no apparatus limitations whatsoever (Pet. App. 29). Indeed, as the court below pointed out, "since the claim does not itself call for any particular hardware, the method within the claim can be practiced either with apparatus other than that described [in the application] or with the simplest of equipment" which could include " 'pencil and paper'—or even, * * * poker chips" (Pet. App. 29–30)." Nor does claim 13 have any end use limitation, which Morse did have. There is no use limitation in respondents' claim 8, either, and the only apparatus limitation in that claim is that the procedure be carried out in apparatus having a "shift register." " Since all digital computers necessarily utilize a shift register, this is at most to say

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" The court below considered the greater breadth and generality of claim 13 to be immaterial, because it seemed improbable to it that anyone would ever want to make the conversion with pencil and paper. It based this statement on the assumption (not supported by any evidence adduced before the Patent Office in this case) that "speed measured in milli- or even micro- seconds [is] essential in the practical utilization of such a process" (Pet. App. 30–31). But it is surely not proper to grant what would otherwise be an undeserved and therefore objectionable patent monopoly merely because it appears at the time of the grant that it is improbable that anyone will in the future desire to practice the subject matter of the grant. More broadly, we would consider claim 13 objectionable even if it were limited, as claim 8 is said to be, to digital computer or data processing devices—for that too is so indefinite a limitation as to leave the monopoly without any reasonable boundary (which should, of course, be properly related to the application's disclosures).

" A "shift register" is a device for "shifting" or displacing the digits of a number to the left or right. A "reentrant shift

that the apparatus should be a digital computer or other data processing device.[36]

Respondents' reference in claim 8 to a component part of a digital computer is, we submit, no more a limitation conferring patentability than would be, for example, a statement that a claimed method of adding, subtracting, or multiplying numbers is to be carried out on an adding machine or calculator.[37] Indeed, the

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register" operates cyclically, so that shifted numbers are permutated cyclically. See Pet. App. 28; see also Standard Dictionary of Computers and Information Processing (Weik ed. 1969). A "shift" is the displacement of a number to the right (down) or left (up) by one or more places or digit positions. If decimal 53 is shifted to the left, it becomes 530; shifted to the right, it becomes 5.3. In binary, shifts to the left (up) or right (down) multiply or divide the number by 2 or a power of 2. Thus shifting binary 101 (decimal 5) left one place makes it binary 1010 (decimal 10); shifting binary 101 right one place makes it binary 10.1 (decimal 2½).

[36] Claim 8 makes reference to the use of a shift register at one stage of the claimed procedure. The Patent Office Board of Appeals made an administrative determination that this language did not restrict the use of the procedure to digital computers, because the term "shift register" comprehended a piece of paper with pencilled notations on it (Pet. App. 41). The reviewing court below took the position that the term referred only to digital computers (Pet. App. 28). Whether the agency or the reviewing court is correct on the facts is immaterial, however, in our view. Even if the process is deemed limited to use in a digital computer, the limitation is too slight and indefinite to permit patentability.

[37] The court below stated that the claimed process did not seek to cover mental steps, because it was intended to be performed by an inanimate object, a programmable computer, which is a patentable machine, like cash registers and adding machines (Pet. App. 28–29). What determines whether a process is patentable, however, is the express wording and scope of the claim, itself, with particular reference to the end use and the specific

digital computer in the hands of a modern scientist is what the desk calculator was to his father or the slide rule was to his grandfather. And there is no claim here that the mathematical principle respondents claim synergizes with the computer or cooperates with it in some new and unconventional way that makes for invention. See *Anderson's-Black Rock, Inc.*, v. *Pavement Co.*, 396 U.S. 57, 61; *Great A & P Tea Co.* v. *Supermarket Equipment Corp.*, 340 U.S. 147; *Lincoln Co.* v. *Stewart-Warner Corp.*, 303 U.S. 545, 549; *Reckendorfer* v. *Faber*, 92 U.S. 347, 353–358; cf. *Deepsouth Packing Co.* v. *Laitbram Corp.*, No. 71–315, decided May 30, 1972.

Without novel and unconventional cooperation between the claimed mathematical principle or programs embodying it and the computer, the claimed method amounts to no more than another conventional use for a known machine, comparable to the insertion of a new piano roll in an old player piano. The development of such a use is not a patentable "discovery." In his famous letter to Isaac McPherson, August 13, 1813, quoted in part in *Graham* v. *Deere*, 383 U.S at 8–9, n. 2, Thomas Jefferson discussed the difficulties the original

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means of operation to be monopolized, and not merely the general nature of the apparatus on which the process is intended to be carried out. Thus, a mathematical procedure does not become patentable because it is for use in a digital computer. As the Board of Appeals said below (Pet. App. 39):

> The fact that a mathematician may, as an aid to his memory, routinely elect to record on a suitable medium the symbols incident to his following the procedure specified by an algorithm, such as pencil and paper or other conventional computational apparatus, does not change the basic character of the process from its being an intangible, abstract line of reasoning.

patent board faced in "'drawing a line between the things that are worth to the public the embarrassment of an exclusive patent, and those which are not.'" The board developed certain general rules, however—

> One of these was, that a machine of which we were possessed, might be applied by every man to any use of which it is susceptible, and that this right ought not to be taken from him and given to a monopolist, because the first perhaps had occasion so to apply it. Thus a screw for crushing plaster might be employed for crushing corn-cobs. And a chain-pump for raising water might be used for raising wheat: this being merely a change of application. VI *Writings of Thomas Jefferson,* 182–184 (Washington ed.).

Thus, even if respondents' claimed method were confined to use in conventional, general-purpose digital computers, this would furnish no limitation that would raise it to the level of a patentable "invention" or "discovery".

Respondents also assert that they could instead have disclosed and claimed specially-designed wire circuits that were a permanent physical part of a machine built to carry out the mathematical procedures claimed here, and that therefore they should be granted a patent on the process which they did claim. We find it doubtful whether the general mathematical principle respondents claim could meaningfully be restricted to any apparatus so as to render the principle itself a patentable discovery. Indeed, there is no reason to believe that even the process of operating such special apparatus or machinery would be patentable. Under

the decisions of this Court, a process which is merely the inherent operation of a patentable machine is not itself patentable; the patent must be on the machine, not on its functioning. *Corning* v. *Burden*, 15 How. 252, 268; *Risdon Locomotive Works* v. *Medart*, 158 U.S. 68, 77; see *Application of Horvath*, 211 F. 2d 604, 607–608 (C.C.P.A.); *Philip* v. *Wildman Jacquard Co.*, 225 F. Supp. 995, 957–958 (E.D. Pa.), affirmed, 337 F. 2d 382 (C.A. 3); *Ferro Co. v. Watson*, 151 F. Supp. 167, 169 (D.D.C.). The Court of Customs and Patent Appeals has recently rejected this doctrine (*Application of Tarczy-Hornoch*, 397 F. 2d 856), but this Court, which originated the rule, has never receded from it.

In any event, the respondents' patent application did not disclose and claim any specially designed apparatus. The issue before this Court is only whether the Patent Office properly rejected the process claims that respondents in fact presented. As this Court said in regard to the unpatented fabric element of the combination patent involved in *Aro Manufacturing Co.* v. *Convertible Top Co.*, 365 U.S. 336, 339, "Whether the fabric or its shape might have been patentable is immaterial, for the fact is that neither the fabric nor its shape has been patented" (footnote ommitted).

Respondents' effort to justify their claim by reference to a limited end use is even thinner than their "limiting" reference to digital computers. Respondents assert that they *plan* to use the method in a "stored-program-controlled electronic telephone switching system for converting dial signals into binary signals" (Resp. Br. in Opp., pp. 1–2). But this intended use is not an element of the claims. As the

court below recognized, "[t]he claims in this case are directed solely to the art of data-processing" and they are in no way limited to "some subsidiary or additional art" (Pet. App. 25). Since the claims are the measure of the grant (*Aro, supra*, 365 U.S. at 339–340), the Patent Office properly relied on their express language in gaging the extent of the monopoly sought by the applicants.

Although the court below emphasized that the methods involved in respondents' claims would almost certainly be implemented by computers, and thus did not explicitly reject the reasoning of the decisions holding pure mental processes unpatentable, the instant case appears to be the most recent of a series of decisions by which the Court of Customs and Patent Appeals has eroded the long standing administrative and judicial doctrine, previously accepted by that court, that "purely mental steps do not form a process which falls within the scope of patentability as defined by statute." *Application of Shao Wen Yuan*, 188 F.2d 377, 380 (C.C.P.A.).[22] The court

[22] The term "process" as used in Section 101 of the Patent Code, and as interpreted by the Patent Office, reflects the concepts articulated in *O'Reilly* v. *Morse* and the *Telephone cases*, *supra*. Cf. *Brenner* v. *Manson*, 383 U.S. 519, 534; *Graham* v. *John Deere Co.*, 383 U.S. 1, 5–6. In *Application of Musgrave*, 431 F. 2d 882, the Court of Customs and Patent Appeals suggested that subsequent decisions of that court (see *Application of Prater and Wei*, 415 F. 2d 1378 (C.C.P.A.)) had altered the earlier standards. The instant case completes this trend by awarding patents for the mental and mathematical calculations involved in computer programming. The Court of Customs and Patent Appeals has recently re-affirmed its holding in this case. See *In re Waldbaum*, 173 U.S.P.Q. 430 (decided April 20, 1972).

recognized that, in fact, the processes involved in the method of computer programming claimed here can be implemented with any kind of equipment which enables one to convert binary coded decimal representations into pure binary numerical representations. As the Court noted, "This could *in theory* be any kind of writing * * * or even, we suppose, red and blue poker chips and a surface to put them on or slots to put them in so that '0's and '1's can be represented." Pet. App. 30. It is thus apparent, in our view, that the decision below rests on no viable distinction between the subject of respondents' claims and pure mental processes. It is therefore contrary to basic tenets of the patent law, long and consistently reflected in the decisions of this Court. Tangible apparatus and machinery for a specific use, and processes tied to specific apparatus and end uses, are patentable, while pure concepts, ideas, laws of nature, and mathematical and mental procedures are not. The latter belong in the public domain as part of the common intellectual property that every member of society has the right to apply to existing or future-devised machinery.

II

PATENTABILITY OF COMPUTER PROGRAMMING METHODS WOULD TEND TO UNDERMINE THE PRESENT PATENT SYSTEM BECAUSE THE CLAIMS IN THIS AREA CANNOT BE ADEQUATELY CLASSIFIED AND SEARCHED

In addition to the undesirable consequences of granting monopoly privileges to abstract ideas, categorization of computer programming methods such

as those claimed by respondents as patentable subject matter would create enormous problems in the administration of the patent system. As several of the *amicus curiae* briefs submitted in support of the parties in this case indicate, an extraordinary volume of art in this area is being generated at a constantly expanding rate. At present there is no adequate system of classification, searching technique and research files for computer programming. Consequently, it is highly doubtful whether the criteria for examination of patent applications required by *Graham* v. *John Deere Co., supra,* 383 U.S. at 18–19, can be effectively applied to applications for patents on computer programs. Rather, if the instant decision stands, patents issued on such applications may be little more in fact than registration certificates, the validity of which must await the test of infringement litigation. Yet, as this Court stated in *Graham* v. *John Deere Co.* (*id* at 18), "To await litigation is—for all practical purposes—to debilitate the patent system."

In the wake of the decision below and its predecessors in the Court of Customs and Patent Appeals, the Patent Office has recently initiated a pilot program, with the cooperation of the Bureau of Standards, to develop techniques for classification and searching of the computer programming art. There is no way to determine at the present time whether this effort will be successful, but the 1966 Report of the President's Commission on the Patent System (reprinted in S. Doc. No. 5, 90th Cong., 1st Sess., p. 21) recognized this problem and stated a skeptical view when it rec-

ommended that computer programs not be patented,[29] in part because it is highly questionable whether an effective system for the examination of computer programs can be developed.[30] Aside from the problems of enormous volume and the economic and personnel constraints faced by the Patent Office, the difficulties of developing an adequate examination system are inherent in the classification of broad abstract mental processes.

These difficulties, in our view, are an additional reason why the Court ought not to discard the mental steps doctrine rejected by the court below. If protection of some kind is desirable for computer programs,[31] the responsibility for devising and delimiting

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[29] Legislation to implement this recommendation by codifying into express statutory language what we believe is the existing law was introduced in the patent revision bill embodying the Report's proposals. See Section 106, S. 1042, 90th Cong. 1st Sess.: "A plan of action or set of operating instructions, in whatever form presented, to cause a controllable data processor or computer to perform selected operations shall not be patentable." The proposal is not contained in the current patent revision bill, however. See S. 643 Comm. Print, 92 Cong., 1st Sess. (Oct. 20, 1971).

[30] The Commission stated that "The Patent Office now cannot examine applications for programs because of the lack of a classification technique and the requisite search files. Even if these were available, reliable searches would not be feasible or economic because of the tremendous volume of prior art being generated. Without this search, the patenting of programs would be tantamount to mere registration and the presumption of validity would be all but nonexistent." S. Doc. No. 5, 90th Cong., 1st Sess., p. 21.

[31] For a forceful presentation of reasons why protection is not desirable, see Breyer, *The Uneasy Case for Copyright: A Study of Copyright in Books, Photocopies, and Computer Programs*, 84 Harv. L. Rev. 281; cf. Comment, *Computer Program Protection: The Need to Legislate a Solution*, 54 Cornell L. Rev. 586

such protection should be left to Congress.[32] For, in applying the patent law "in light of this Nation's historical antipathy to monopoly * * *", the courts should "require a clear and certain signal from Congress before approving the position of a litigant who * * * argues that the beachhead of privilege is wider and the area of public use narrower, than courts had previously thought." *Deepsouth Packing Co., Inc.* v. *Laitram Corp.*, No. 71–315, decided May 30, 1972, slip op., pp. 13–14.[33]

(1969); Note, *Computer Programs and Proposed Revisions of the Patent and Copyright Laws*, 81 Harv. L. Rev. 1541 (1968).

[32] Since 1964 the Copyright Office has accepted computer programs for registration. It has done so, however, subject to the restriction that the courts might ultimately declare that such programs, at least when presented in certain forms, may not be "writings" or "copies" within the meaning of the existing Copyright Act (cf. *White-Smith Music Co.* v. *Appollo Co.*, 209 U.S. 1). Copyright Office Circular No. 61. The report of the President's Commission, supra, noted that "[T]he creation of programs has undergone substantial and satisfactory growth in the absence of patent protection, and that copyright protection for programs is presently available." See generally Breyer, *supra*.

[33] The protection of computer programs is the subject of world-wide concern and is in a state of flux. In Canada, the Economic Council, an agency similar to the American Council of Economic Advisors, prepared a study on intellectual and industrial property rejecting patent or copyright protection for computer software. See Patent and Trademark Institute of Canada, Newsletter #36, August 9, 1971. Nevertheless the Canadian Patent Office has recently reversed its earlier position and has now granted a patent on a computer program. BNA Patent, Trademark & Copyright Journal, December 23, 1971, p. D-1. The British Patent Office has also done so. *Id.* It does not appear that the courts in either country have considered the issue under their respective patent statutes. The World Intellectual Property Organizations' expert advisory group, in a meeting at Geneva, March 8–12, 1971, recommended that that agency undertake a study of the factors which may constitute appropirate ingredients for a

CONCLUSION

The judgment of the Court of Customs and Patent Appeals should be reversed.

Respectfully submitted.

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system of legal protection for computer programs, but without following rigidly the lines of established legal concepts for the protection of inventions or other works. Report, *Advisory Group of Governmental Experts on the Protection of Computer Programs*, World Intellectual Property Organization, WIPO DOC AGCP/6, 1971. Some countries, such as Switzerland (see Patent Muster Und Markenblatt 68-1-53) and the Netherlands (BIE No. 2, February 15, 1971) have refused to grant patents to computer programs on the ground that programs are mental steps rather than processes.